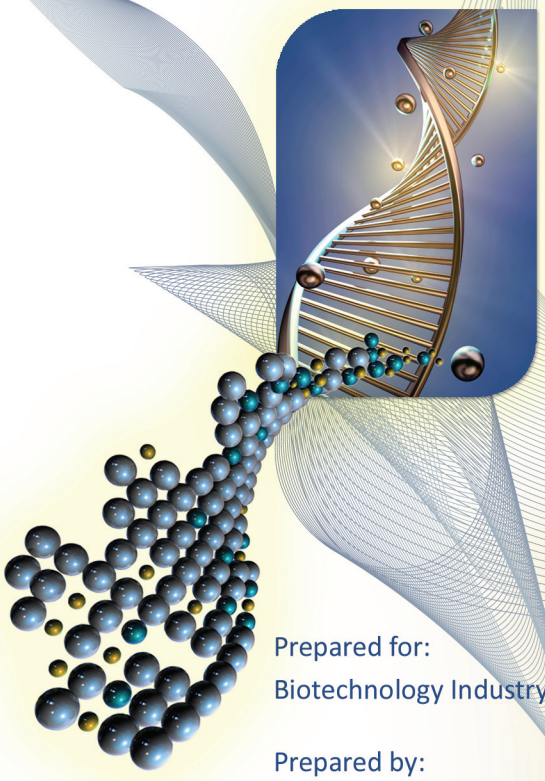


EXECUTIVE SUMMARY

Battelle/BIO State Bioscience Initiatives 2010

Prepared for:
Biotechnology Industry Organization

Prepared by:
Battelle Technology Partnership Practice

May 2010

Bio BIOTECHNOLOGY INDUSTRY ORGANIZATION

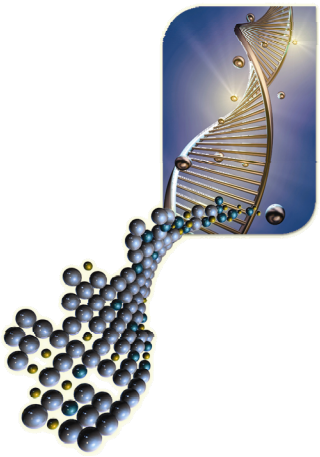
Battelle
The Business of Innovation

The Project Team

Battelle is the world's largest nonprofit independent research and development organization, providing innovative solutions to the world's most pressing needs through its four global businesses: Laboratory Management, National Security, Energy Technology, and Health and Life Sciences. In 1991, Battelle created the Technology Partnership Practice (TPP). We focus Battelle's broad experience to better serve economic development organizations, universities, and nonprofit technology organizations across the U.S.

BIO—Biotechnology Industry Organization—BIO represents more than 1,200 biotechnology companies, academic institutions, state biotechnology centers and related organizations across the United States and in more than 30 other nations. BIO members are involved in the research and development of innovative healthcare, agricultural, industrial and environmental biotechnology products. BIO also produces the BIO International Convention, the world's largest gathering of the biotechnology industry, along with industry-leading investor and partnering meetings held around the world.

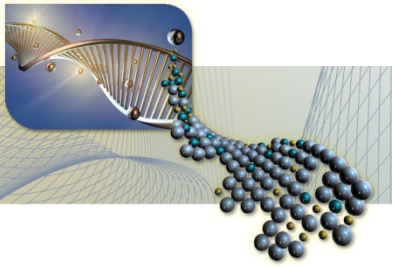
PMP Public Affairs Consulting, Inc. is an independent consulting firm serving the public and constituent relations needs of bioscience-related companies and associations.



Acknowledgement

The project team wishes to thank BIO's Council of State Biotechnology Associations (CSBA) members who provided updates on state policies and programs to promote the biosciences in their states.

Executive Summary



In the 21st century, the biosciences are already shaping up to be a key engine of economic growth in the United States. Major advancements are taking place on a host of bioscience fronts, ranging from high-precision personalized human biomedical applications to widespread biomass-based innovations in agbioscience, bioenergy, and industrial biotechnology. Without a doubt, the biosciences promise solutions to many of the global challenges the world faces.

Battelle, BIO, and PMP Public Affairs Consulting, Inc., have tracked the development of the U.S. bioscience industry on a state and metropolitan area basis, along with trends in key innovation and talent drivers of bioscience development and the implementation of state policies and programs to support the bioscience industry, on a 2-year basis since 2004. This 2010 report presents the following:

- Data on national, state, and metropolitan bioscience employment and growth trends from 2001 to 2008, with a 1 year view into how the biosciences have fared in the midst of the current recession
- National and state-level data on bioscience research and development (R&D), venture capital investments, patents, degrees awarded, employment by occupation and clinical trials activity
- An examination at the national level of the financial performance of the bioscience sector, which addresses its long-term sustainability and growth.

These data are presented for all 50 states, the District of Columbia, and Puerto Rico.

Defining the "Biosciences"

The biosciences are a diverse group of industries and activities with a common link—they apply knowledge of the way in which plants, animals, and humans function. The sector spans different markets and includes manufacturing, services, and research activities. By definition, the biosciences are a unique industry cluster and are constantly changing to incorporate the latest research and scientific discoveries.

The bioscience industry sector is defined as including the following four subsectors:

- *Agricultural Feedstock and Chemicals*
- *Drugs and Pharmaceuticals*
- *Medical Devices and Equipment*
- *Research, Testing, and Medical Labs*

A Note About the Data: This report presents employment data for 2008, the most current year for which detailed industry data are available. While 2008 encompasses the first year of the recent recession, the real impacts of the recession are likely to be reflected in the 2009 data once these data become available. Other data sources suggest that the bioscience industry, while impacted by the recession, was not as negatively affected as many other industry sectors and appears to be rebounding more quickly. The first quarter of 2010 saw the Amex Biotech Index (BTK) hit an all-time high and the Nasdaq Biotech Index (NBI) climbed to its highest level in more than 8 years. Both of these biotech indices are up since the financial crises began in October 2007, something no sector in the S&P 500 can claim. Source: http://insidebioia.com/, 04/13/2010

Key Findings: Bioscience Industry and Development Trends

The overall bioscience industry employment base continued to grow, even during the first year of the recession. Total employment in the U.S. bioscience sector reached 1.42 million in 2008 (the latest year for which data are currently available), continuing its strong job gains from the previous economic expansion through 2007, and through 2008 (Table ES-1). During the first year of the recession, employment in the bioscience industry grew 1.4 percent, while total private sector employment declined by 0.7 percent. This 2008 growth was broadly shared across the following bioscience subsectors:

The total employment impact of the bioscience sector is 8 million jobs, taking into account the additional jobs created in the economy as a result of the sector's direct jobs. On a national basis, for every new bioscience job, another 5.8 jobs are created.

- Research, testing, and medical labs adding 11,670 jobs or 2.1 percent from 2007 to 2008
- Medical devices and equipment adding 10,140 jobs or 2.4 percent from 2007 to 2008
- Agricultural feedstock and chemicals adding 5,021 jobs or 4.6 percent from 2007 to 2008.

Only drugs and pharmaceuticals shed jobs from 2007 to 2008, with a decrease of 7,445 jobs or 2.3 percent.

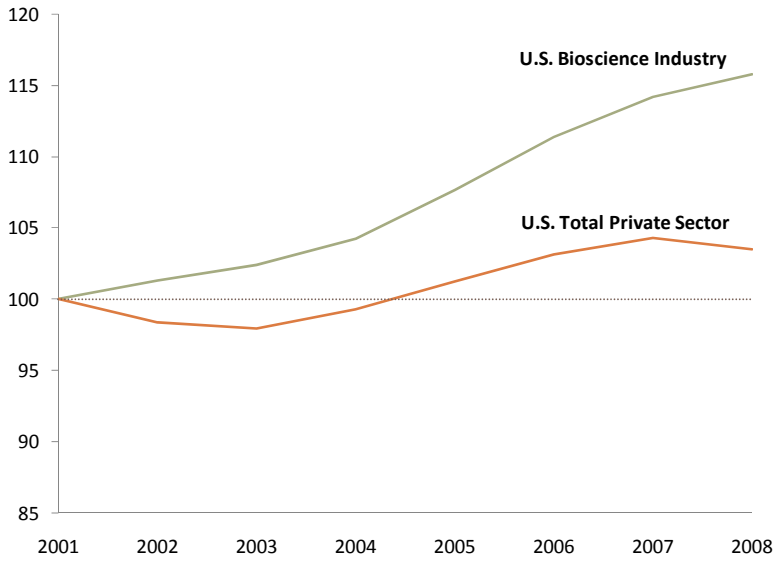
Table ES-1. U.S. Bioscience Employment and Establishments, 2008, and Changes, 2001–08 and 2007–08

Bioscience Subsector	2008 Establishments	Change in Establishments, 2001–08	Change in Establishments, 2007–08	2008 Employment	Change in Employment, 2001–08	Change in Employment, 2007–08
Agricultural Feedstock & Chemicals	2,440	16.0%	6.4%	114,793	1.9%	4.6%
Drugs & Pharmaceuticals	2,771	6.4%	2.0%	311,882	2.3%	-2.3%
Medical Devices & Equipment	15,227	0.4%	1.6%	435,509	2.0%	2.4%
Research, Testing, & Medical Laboratories	27,154	57.7%	6.1%	558,140	46.1%	2.1%
Total U.S. Biosciences	**47,593**	**28.3%**	**4.4%**	**1,420,324**	**15.8%**	**1.4%**

Source: Battelle analysis of BLS, QCEW data from the Minnesota IMPLAN Group.

Bioscience employment growth greatly outpaced national employment growth from 2001 to 2008. The bioscience industry added 193,748 jobs from 2001 to 2008, a hefty growth rate of 15.8 percent. This rapid rate of job growth was 4.5 times as much as the overall growth rate for the national private sector (3.5 percent) (Figure ES-1).

Figure ES-1. U.S. Bioscience and Total Private Sector Employment, 2001–08, Indexed (2001=100)



Rapid job growth in the biosciences has been fueled primarily by growth in research, testing, and medical laboratories. The subsector has continuously grown since 2001, adding more than 176,000 jobs or 46.1 percent to its employment base during the 7-year period (Figure ES-2). This growth represents 9 out of every 10 new bioscience jobs created. Research, testing, and medical labs now account for 39 percent of total bioscience employment, up from 35 percent in 2006 (Figure ES-3). Agricultural feedstock and chemicals maintained its 8 percent share of bioscience employment; drugs and pharmaceuticals and medical devices and equipment now account for 22 percent and 31 percent of bioscience employment, respectively.

Figure ES-2. U.S. Employment by Bioscience Subsector, 2001, 2007, and 2008

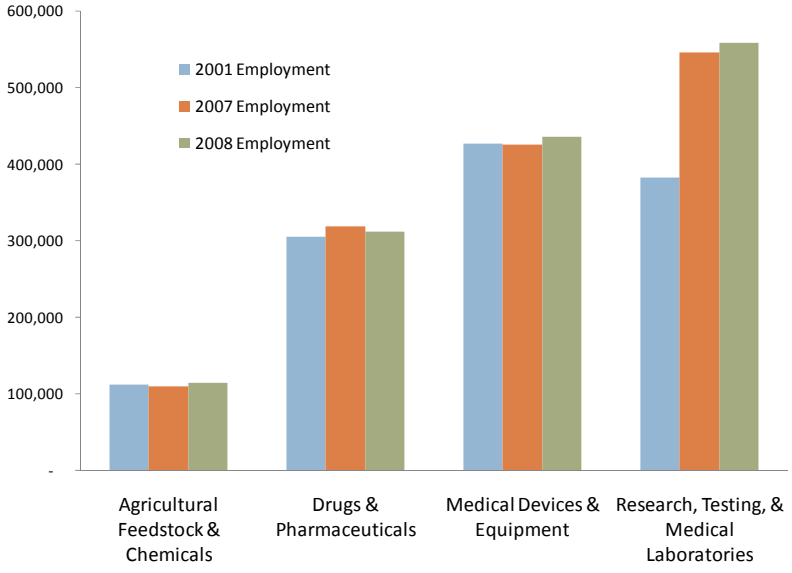
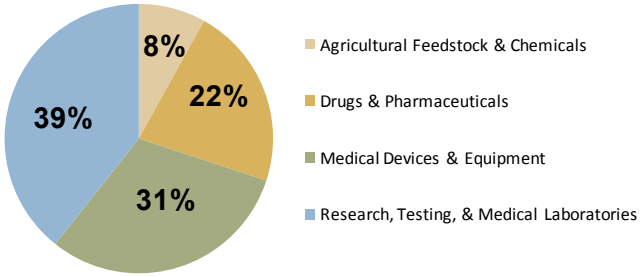


Figure ES-3. Employment Composition of the U.S. Bioscience Sector, 2008



The bioscience sector continues to be a source of high-wage jobs. The overall bioscience sector paid average annual wages of $77,595 in 2008, up from $70,959 in 2006 (Table ES-2). On average, bioscience jobs paid $32,366 more than the average annual wage of the total U.S. private sector, which was $45,229 in 2008. Bioscience wages also are outpacing the national private sector in growth. Since 2001, real (inflation-adjusted) earnings for biosciences industry workers have increased by 10.1 percent, compared with 3.2 percent for the U.S. private sector.

Table ES-2. Average Annual Wages in the Biosciences and Other Major Industries, 2008

U.S. Average Annual Wages per Employee, 2008		
Drugs & Pharmaceuticals	**$**	**93,378**
Finance and Insurance	$	85,274
Research, Testing, & Medical Laboratories	**$**	**80,785**
Total Biosciences	**$**	**77,595**
Professional, Scientific, and Technical Services	$	74,354
Agricultural Feedstock & Chemicals	**$**	**72,279**
Information	$	70,780
Medical Devices & Equipment	**$**	**63,606**
Manufacturing	$	54,392
Construction	$	49,014
U.S. Total Private Sector	**$**	**45,229**
Real Estate and Rental and Leasing	$	43,239
Transportation and Warehousing	$	42,969
Health Care and Social Assistance	$	42,150
Retail Trade	$	26,181

Source: Battelle analysis of BLS, QCEW data from the Minnesota IMPLAN Group

Looking to the future, the biosciences remain positioned for strong economic growth. The U.S. Department of Labor projects that the biosciences will grow at an average annual rate of 1.5 percent between 2008 and 2018, making it one of the fastest-growing industry sectors. Overall private sector employment is projected to grow by an average annual rate of 1 percent during this time period.

Bioscience employment is distributed across the United States, with many states developing strong niches in certain specializations. Thirty-nine states, the District of Columbia, and Puerto Rico—up from 35 in 2006—now have a specialization in one of the bioscience subsectors. Four states—Wyoming, South Carolina, Wisconsin and Montana developed specializations in the agricultural feedstock and chemicals subsector since 2006. Massachusetts developed a specialization in the drugs and pharmaceuticals subsector and Vermont and New Jersey developed specializations in the medical devices and equipment subsector. Five states—California, Indiana, Massachusetts, New Jersey, and North Carolina—and Puerto Rico are specialized in three of the four bioscience subsectors. Table ES-3 shows the states that have both large (accounting for 5 percent or more of total U.S. employment) and specialized (an employment concentration that is 20 percent or more above the U.S concentration) bioscience subsectors.

Table ES-3. States with Both Large and Specialized Bioscience Subsectors, 2008

States	Agricultural Feedstock & Chemicals	Drugs & Pharmaceuticals	Medical Devices & Equipment	Research, Testing, & Medical Laboratories
California		●	●	●
Illinois	●	●		
Indiana		●		
Iowa	●			
Massachusetts			●	●
Minnesota			●	
New Jersey		●		●
North Carolina		●		
Ohio	●			
Pennsylvania		●		●
Puerto Rico		●		
Tennessee	●			
Texas	●			

Source: Battelle analysis of BLS, QCEW data from the Minnesota IMPLAN Group.

The following pages show the geographical distribution of bioscience employment in each of the four bioscience subsectors—agricultural feedstock and chemicals, which includes ethanol and biodiesel production; drugs and pharmaceuticals; medical devices and equipment; and research, testing and medical laboratories.

AGRICULTURAL FEEDSTOCK and CHEMICALS

The agricultural feedstock and chemicals subsector applies life sciences knowledge, biochemistry, and biotechnologies to the processing of agricultural goods and the production of organic and agricultural chemicals. The subsector also includes activities around the production of biofuels.

Examples of Products

Fertilizers, pesticides, herbicides, and fungicides

Corn and soybean oil

Ethanol and biodiesel fuels

Biodegradable materials synthesized from plant-based feedstock

Sustainable industrial oils and lubricants

Biocatalysts

Examples of Companies

Archer Daniels Midland

BASF Plant Science

Bayer CropScience

Bunge

Cargill

Dow AgroSciences

DuPont

Intrepid Potash

Monsanto

Scotts Miracle-Gro

Syngenta

States that are Both Large and Specialized*

Texas

Illinois

Iowa

Ohio

Tennessee

Metro Areas with the Largest Employment Levels*

Houston-Baytown-Sugar Land, TX

New York-Northern New Jersey-Long Island, NY-NJ-PA

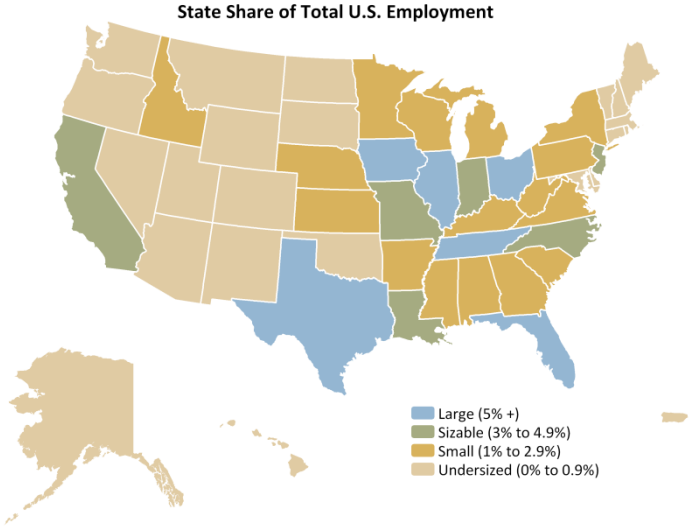
Decatur, IL

Indianapolis, IN

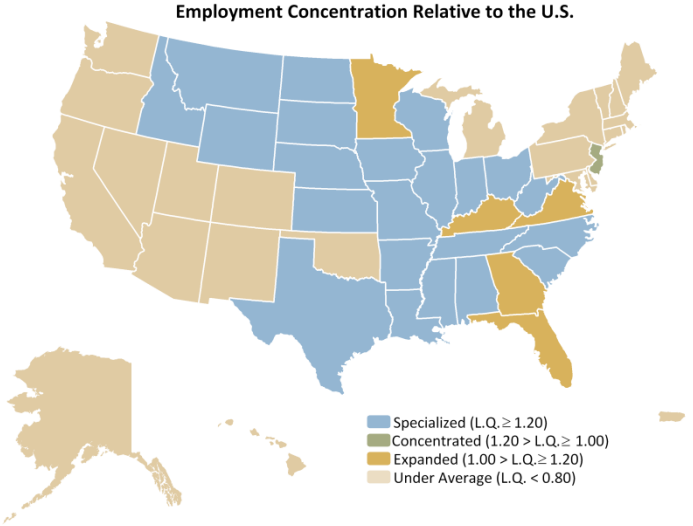
Memphis, TN-MS-AR

*States and MSAs are listed in descending order by subsector employment levels.

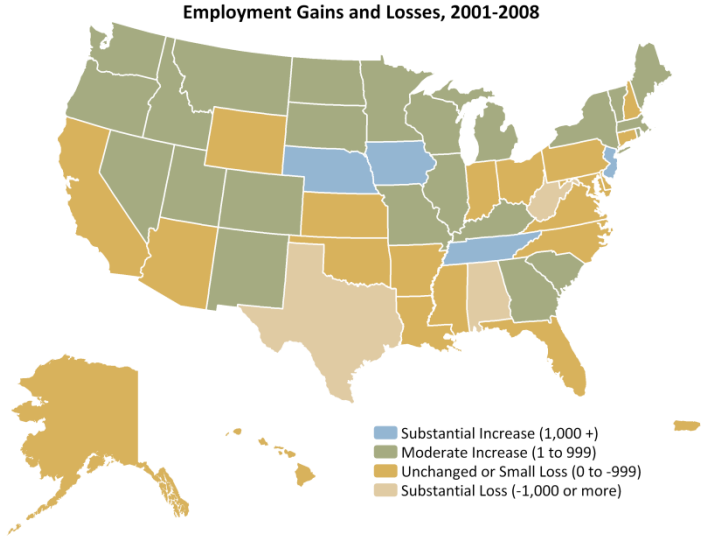
State Share of Total U.S. Employment



Employment Concentration Relative to the U.S.



Employment Gains and Losses, 2001-2008



DRUGS and PHARMACEUTICALS

The drugs and pharmaceuticals subsector produces commercially available medicinal and diagnostic substances. The subsector is generally characterized by large multinational firms heavily engaged in R&D and manufacturing activities to bring drugs to market.

Examples of Products

Vaccines
Targeted disease therapeutics
Biopharmaceuticals
Tissue and cell culture media
Dermatological/topical treatments
Diagnostic substances
Animal therapeutics and vaccines

Examples of Companies

Abbott Laboratories
Amgen
Biogen Idec
Cornerstone Therapeutics
Eli Lilly & Co.
Merck & Co.
Mylan
Novartis
Pfizer
Roche Group – Genentech
Sanofi-Aventis/Sanofi Pasteur

States that are Both Large and Specialized*

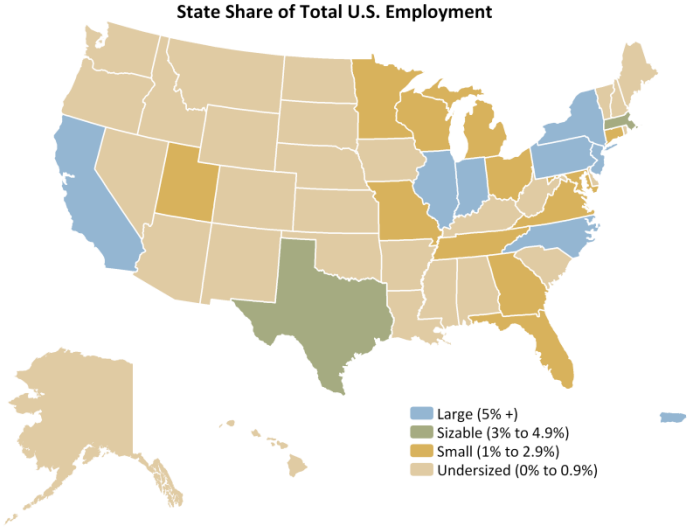
California
New Jersey
Puerto Rico
Pennsylvania
Indiana
North Carolina
Illinois

Metro Areas with the Largest Employment Levels*

New York-Northern New Jersey-Long Island, NY-NJ-PA
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
Chicago-Naperville-Joliet, IL-IN-WI
Indianapolis, IN
San Francisco-Oakland-Fremont, CA

*States and MSAs are listed in descending order by subsector employment levels.

State Share of Total U.S. Employment



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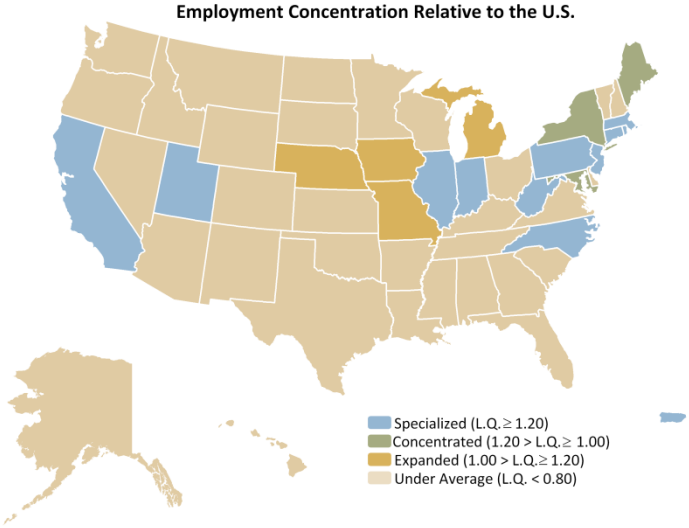
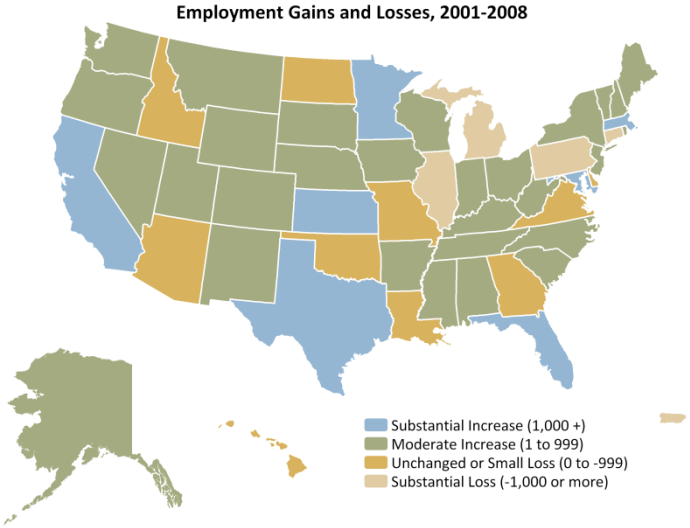


Employment Gains and Losses, 2001-2008



MEDICAL DEVICES and EQUIPMENT

Firms in the medical device and equipment subsector produce a variety of biomedical instruments and other health care products and supplies for diagnostics, surgery, patient care, and laboratories. The subsector is continually advancing the application of electronics and information technologies to improve and automate testing and patient care capabilities.

Examples of Products

Bioimaging equipment
Surgical supplies and instruments
Orthopedic/prosthetic implants and devices
Laser eye surgery instruments
Automated external defibrillators (AEDs)
Vascular stents and other implantable devices
Dental instruments and orthodontics
Walkers, wheelchairs, and beds

Examples of Companies

Alcon
Becton, Dickinson and Co.
Boston Scientific Corp.
GE Healthcare
Medtronic
Roche Group – Ventana
Siemens Medical Solutions
STERIS
Stryker
Zimmer
3M Health Care

States that are Both Large and Specialized*

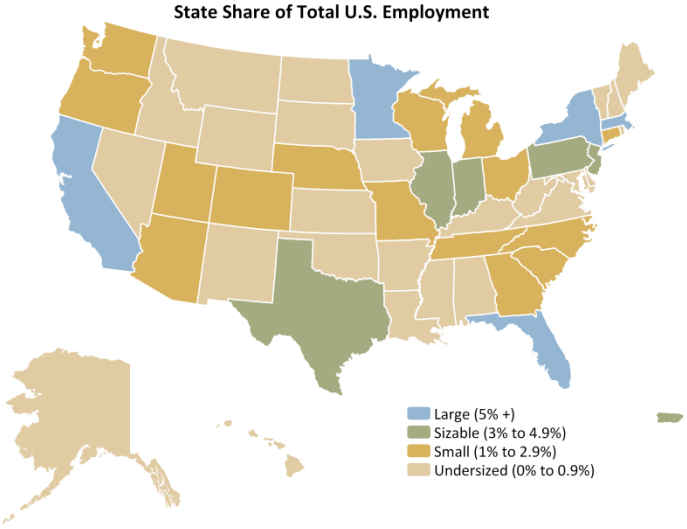
California
Minnesota
Massachusetts

Metro Areas with the Largest Employment Levels*

Los Angeles-Long Beach-Santa Ana, CA
Minneapolis-St. Paul-Bloomington, MN-WI
New York-Northern New Jersey-Long Island, NY-NJ-PA
Boston-Cambridge-Quincy, MA-NH
Chicago-Naperville-Joliet, IL-IN-WI

*States and MSAs are listed in descending order by subsector employment levels.

State Share of Total U.S. Employment



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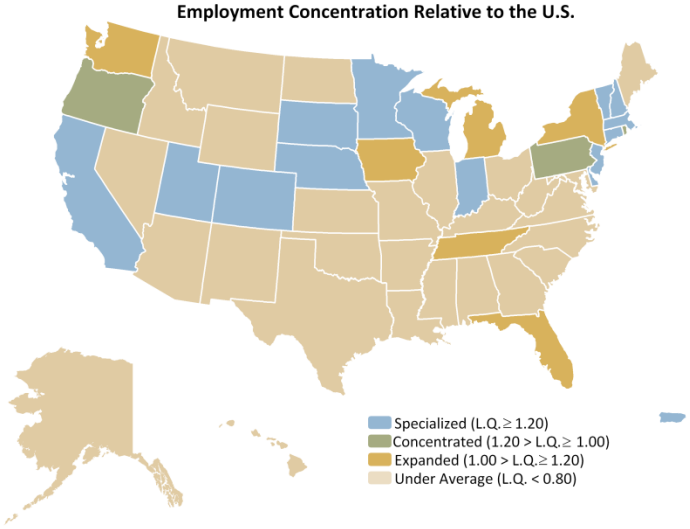
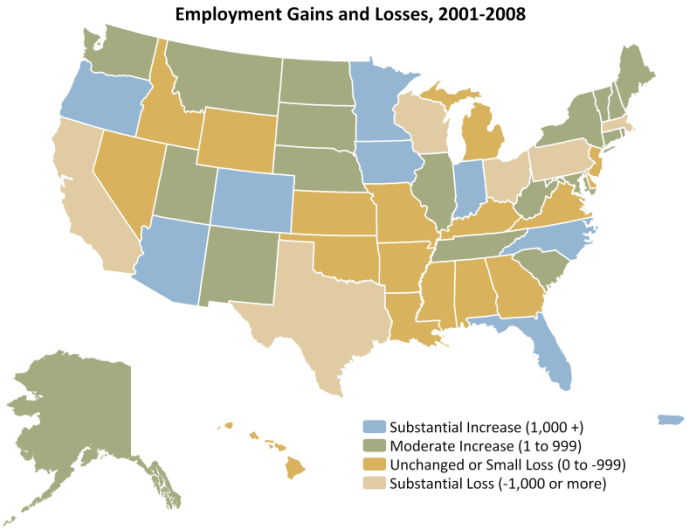


Employment Gains and Losses, 2001-2008



RESEARCH, TESTING, and MEDICAL LABORATORIES

The research, testing, and medical laboratories subsector includes a range of activities; from highly research-oriented companies working to develop and commercialize new drug discovery/delivery systems, and gene and cell therapies, to more service-oriented firms engaged in medical and other life sciences testing services.

Examples of Products

Preclinical drug development
Drug delivery systems
Diagnostic imaging and testing
Stem cell/regenerative research
Biomarkers
Research/laboratory support services

Examples of Companies

Albany Molecular Research
Celera
Charles River Laboratories
Covance
Laboratory Corp. of America
NeoGenomics
Orchid Cellmark
Pacific Biomarkers
Pharmaceutical Product Development
Quest Diagnostics

States that are Both Large and Specialized*

California
Massachusetts
Pennsylvania
New Jersey

Metro Areas with the Largest Employment Levels*

New York-Northern New Jersey-Long Island, NY-NJ-PA
Boston-Cambridge-Quincy, MA-NH
Los Angeles-Long Beach-Santa Ana, CA
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD
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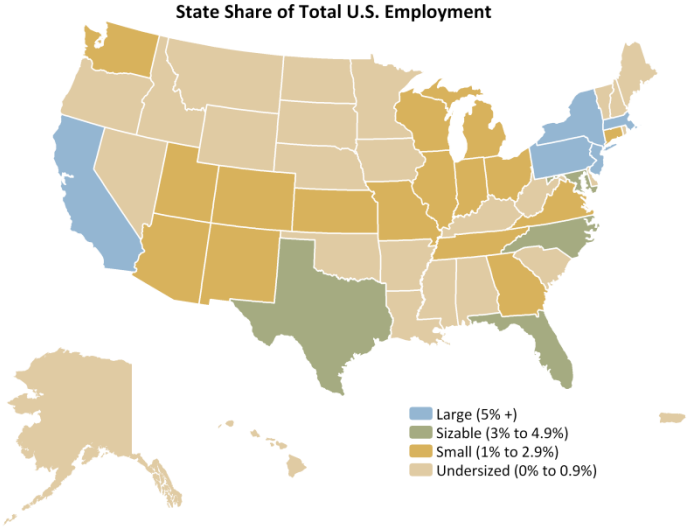

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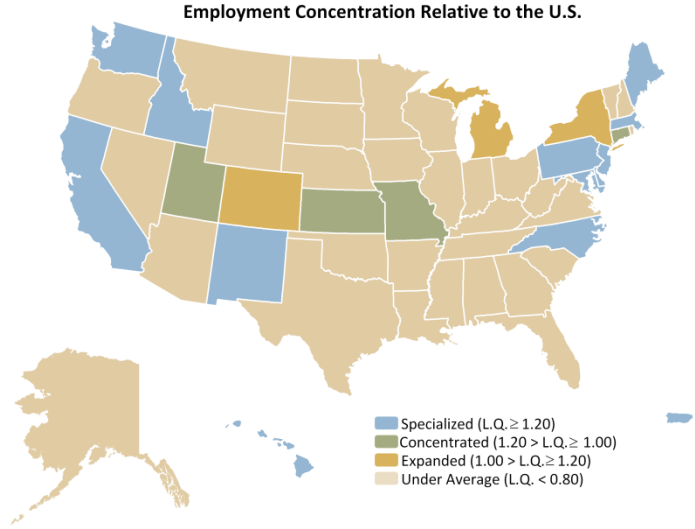
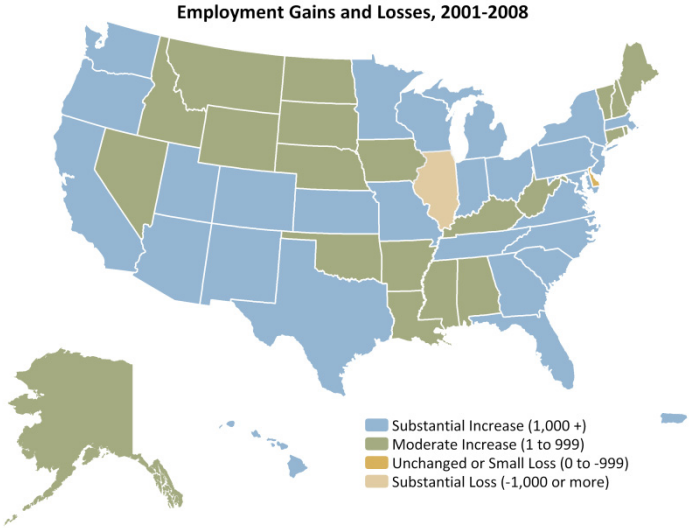


Employment Gains and Losses, 2001-2008



Key Findings: Bioscience Performance Measures

A special analysis of the financial performance of 649 public bioscience companies in 2009 suggests that, even during the recession, the bioscience industry is a positive generator of net income across each subsector, whether research, testing, and medical labs; agricultural feedstock and chemicals; medical devices and equipment; or drugs and pharmaceuticals. What does differentiate the financial performance of bioscience companies is their size. Those below $100 million in revenues do not, on average, record a positive net income, while the 79 public bioscience firms with over $1 billion in revenue generate nearly all of the net income for the biosciences. This reflects the long periods before the research and development of these companies pays off in net income.

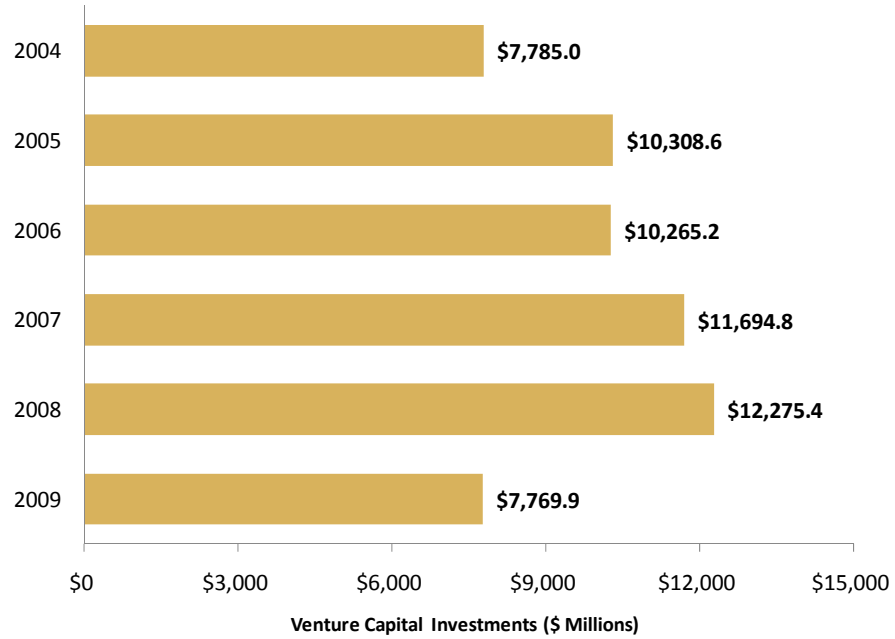
U.S. academic bioscience R&D expenditures have increased steadily from fiscal year (FY) 2004 through FY 2008. Bioscience R&D expenditures totaled nearly $32 billion in FY 2008, accounting for more than 60 percent of all U.S. academic R&D, with many individual states significantly exceeding that share.

The relative strength and innovation of the U.S. bioscience sector is reflected in the number of bioscience patents issued. Bioscience-related patents totaled 75,593 over the six-year, 2004 to 2009 period.[1] Bioscience-related patents reached 13,150 in 2009, the second-largest yearly total of the period.

But, there are clear warning signs of threats to future bioscience industry development.

- Capital Availability: Venture capital to bioscience companies fell a dramatic 36.7 percent between 2008 and 2009, from $12.275 billion to $7.770 billion. In 2009, bioscience venture capital stood below levels recorded back in 2004 (Figure ES-4).

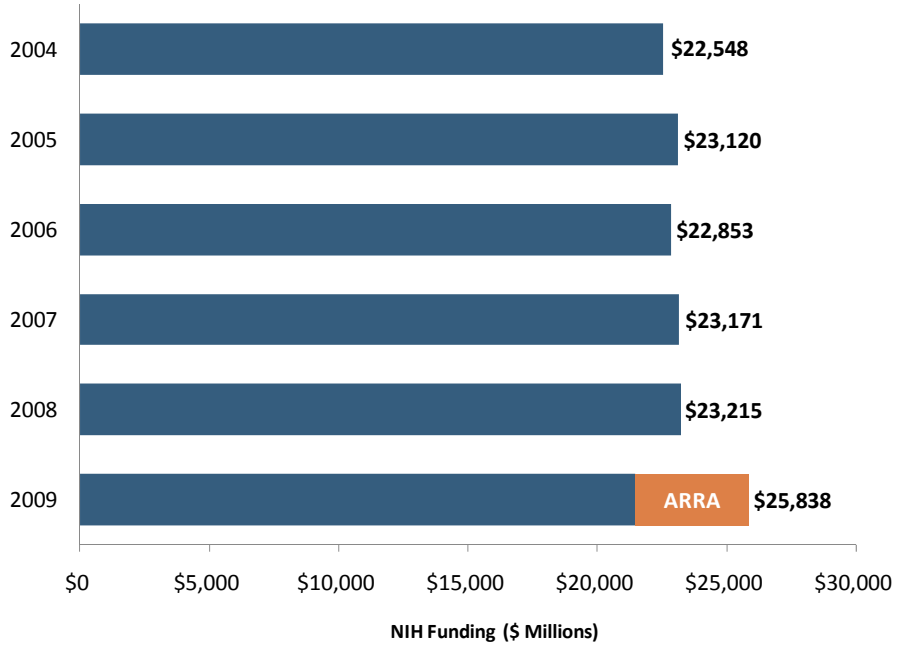
Figure ES-4. U.S. Bioscience Venture Capital Investments, 2004–2009



[1] This figure counts each patent once for the United States. Adding together each state's patent figures would yield a total of 96,948 as many patents have inventors located in more than one state, with each state receiving credit for the patent, and hence leading to a level of double-counting when adding individual state totals together.

- National Institutes of Health (NIH) Funding: Without the economic stimulus funding, NIH funding recorded a decline in extramural research funding of $1.732 billion or 7.46 percent from 2008 to 2009. The boost of $4.354 billion in stimulus funding was a very important infusion and allowed NIH extramural research funding to grow significantly over 2008. A key question in light of current federal budget woes is what happens after the recession (Figure ES-5).
- Bioscience Talent: While post-secondary bioscience graduates at all levels (associates, bachelor's, master's and doctorate) grew from 2006 to 2008 by a robust 12.8 percent, there is still concern that, at the K-12 level, the United States is continuing to fall behind in math and science education and may have trouble meeting the needs of bioscience companies for skilled, technical workers. A study conducted by Battelle, BIO, and the Biotechnology Institute in 2009 concluded that states are not measuring up in terms of K-12 bioscience education and that wide disparities exist among states in student performance in the biosciences and broader sciences.[2]

Figure ES-5. U.S. Extramural NIH Funding, FY 2004–FY 2009



[2] Battelle, *Taking the Pulse of Bioscience Education in America: A State by State Analysis*, May 2009.

Key Findings: State Bioscience Initiatives

States continue to make investments designed to encourage the growth of the bioscience sector despite challenging state fiscal conditions. According to the National Association of State Budget Officers, the 50 states are facing the worst fiscal period since the Great Depression, with fiscal conditions deteriorating significantly in fiscal year (FY) 2009 and the trend expected to continue through FY 2010 and into FY 2011. Forty-three states reduced their enacted budgets in FY 2009 as tax revenues declined as a result of the national recession.[3] In response, however, some states are creating new initiatives aimed at growing the economy by investing in technology-based economic development. Many of these initiatives are targeted to the biosciences, which have continued to be a key driver of economic growth.

Key Findings: States

- Continue to invest in bioscience development despite state fiscal challenges
- Are focusing on the agricultural biotechnology, bioenergy and bioproducts industry subsectors
- Are implementing new programs to build R&D capacity and advance commercialization of research discoveries
- Continue to address need for early-stage capital
- Are enacting tax policies that are supportive of the bioscience industry

States are actively promoting the growth of their agricultural biotechnology, bioenergy, and bioproducts industry subsectors. As discussed previously, the bioeconomy has arrived. Biobased materials and renewable products are becoming cost-effective alternatives to petroleum-based counterparts. States are actively supporting the development of this bioeconomy, using many of the same mechanisms and programs that also are used to support the biomedical sector. But, in addition, states are creating programs and partnerships that are targeted specifically to the bioagriculture, bioenergy, and biobased products industries.

States continue to put in place new programs to build bioscience R&D capacity and to encourage the commercialization of new discoveries. Recognizing that a strong bioscience R&D base is a prerequisite to growing a robust bioscience industry cluster, states continue to create mechanisms designed to position universities to compete for bioscience R&D awards and to commercialize the results of research findings.

States continue to create programs to address the need for early-stage capital for bioscience companies. Venture capital firms invested **a**pproximately $7.8 billion in bioscience companies nationally in 2009, down from $11.7 billion and $12.3 billion in 2007 and 2008, respectively. In addition to the fact that there has been a decline in overall venture capital investing, only about 6 percent of the total dollars invested between 2004 and 2009 was invested in start-up bioscience companies, with another 17.7 percent in early-stage bioscience firms. Also, bioscience venture investing is geographically concentrated, with about 70 percent of the total being invested going to firms in just five states: California, Massachusetts, New Jersey, Pennsylvania, and Texas. As a result, states seeking to grow their bioscience industry continue to look for ways to help firms within their state access needed capital by investing in funds that agree to make in-state investments or locate offices in a particular state, helping companies tap the federal Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs and directly investing in companies.

[3] National Governors Association and National Association of State Budget Officers, *Fiscal Survey of the States*, December 2009.

States continue to use tax policies to support the bioscience industry. Thirty-eight states reported offering R&D tax credits, an increasing number of which offer a larger credit if the research is conducted by an in-state university. States also use tax policies to encourage private investment in early-stage companies and/or in funds that make early-stage investments. Twenty states offer tax credits to angel investors who invest in technology companies, six of which are targeted specifically to angel investors who invest in bioscience companies. Twelve states reported providing tax credits to individuals who invest in early-stage venture funds. States also use tax credits to increase the availability of venture capital. As of 2010, 13 states reported investing in a fund of funds, 10 states reported investing state dollars in private venture-capital firms, and 14 states reported making direct investments in bioscience companies. Thirty-four states reported exempting sales tax for equipment used in R&D, including equipment purchased for biomanufacturing, and 33 states reported exempting equipment purchased for biomanufacturing from sales tax. Seven states have sales tax exemptions specifically targeted to bioscience firms.

Conclusion

The bioscience industry is a diverse and rapidly growing sector that is contributing significantly to national, state and regional economies. The industry has recorded continued employment growth even through the first year of the recession, and the financial performance of public biosciences companies through the end of 2009 was positive.

Bioscience development is not simply about generating economic returns, however. The great promise of the biosciences is its ability to address global problems from human health to food generation and security to environmental sustainability and clean energy. Bioscience development pays huge social and quality-of-life dividends for the U.S. and the world.

But continued biosciences development is not guaranteed. States are facing difficult fiscal times that threaten to roll-back many of the key economic development programs that were put in place over the past decade. Federal fiscal woes threaten NIH funding, a key generator of U.S. leadership in basic research. The recent recession and its impact on capital markets have created a very sharp decline in venture capital for bioscience companies, which is critical to advancing biosciences innovation into the marketplace. And, in the long-term, the talent pipeline in the biosciences remains an area of significant concern. State and national policymakers have a key role to play in ensuring that these challenges are addressed in order to allow the U.S. to continue to be a world leader in the biosciences.

And finally, with the U.S. Congress just completing work on the most sweeping overhaul of the nation's healthcare system, it remains unclear what impact this legislation will have on bioscience industry development in the long term. The legislation included provisions to create a pathway for the approval of follow-on biotechnology medicines, and a $1 billion therapeutic discovery tax credit, both of which were widely supported by the bioscience industry. In addition, the legislation significantly expands Medicare and Medicaid discounts and rebates, and imposed an excise tax on the sales of drugs and medical devices. The impact of these increases in costs to drug and device makers, designed to be offset by the addition of 32 million uninsured to the marketplace, will take some time to determine.

Understanding the Financial Performance of the Bioscience Industry

One concern about the bioscience industry expressed over the years is that the sector is R&D driven and not able to create and sustain viable businesses for the long term. Clearly, the strong growth of the biosciences in employment indicates that it is a sustainable industry sector, but a more direct measure is its overall profitability as measured by net income.

To this end, Battelle developed a dataset of public bioscience companies to assess both total revenue and total net income on a subsector basis. This dataset was constructed using Hoover's corporate database (financial data from Morningstar Financial) and corporate SEC filings (primarily 10-Ks). The industry codes and product descriptions included with these sources were used to classify firms into one of the four bioscience industry subsectors. In this classification effort, the firm was classified based upon the sector of the overall corporation (though also examining the classification of its individual establishments). Therefore, firms such as ADM, Cargill, Cardinal Health, and 3M with one or more "bioscience" establishments (locations), but within a corporate industry outside of the definition of bioscience sectors, are ***not*** included in the dataset. Ultimately, Battelle identified 649 public bioscience companies with reported fiscal year 2009 financial information to include in this analysis.

While each of the four bioscience subsectors had firms reporting positive net income and firms reporting negative net income, ***all four bioscience subsectors showed, on average, a positive net income in 2009***.

Bioscience Financial Performance by Subsector and Net Income, FY 2009

Bioscience Subsector	Net Income	Number of Public Firms in Dataset	FY 2009 Revenue		FY 2009 Net Income	
			$ Millions	% of Industry	$ Millions	% of Industry
Agricultural Feedstock & Chemicals	Positive	20	$116,711		$8,379	
	Negative	14	$3,531		$(645)	
Subsector Total		34	$120,242	21%	$7,734	10%
Drugs & Pharmaceuticals	Positive	98	$322,088		$66,343	
	Negative	285	$7,574		$(8,334)	
Subsector Total		383	$329,661	57%	$58,009	78%
Medical Devices & Equipment	Positive	84	$89,913		$11,897	
	Negative	98	$16,103		$(4,776)	
Subsector Total		182	$106,016	18%	$7,121	10%
Research, Testing, & Medical Laboratories	Positive	22	$20,152		$1,910	
	Negative	28	$1,278		$(231)	
Subsector Total		50	$21,430	4%	$1,680	2%
Total Biosciences	Positive	224	$548,863		$88,529	
	Negative	425	$28,485		$(13,985)	
Industry Total		649	$577,349	100%	$74,544	100%

Only in agricultural feedstock and chemicals did a majority of firms report a positive net income in fiscal year 2009. While drugs and pharmaceuticals account for 78 percent of the entire bioscience industry's net income, it also accounts for two-thirds of the firms with a negative net income (285 out of 425 or 67 percent). Many of the negative net-income firms in this subsector are much more aligned with a traditional R&D firm than they are with a pharmaceutical firm in that many had revenues at or near $0. Research, testing, and medical laboratories have a positive net income on average. Much of the revenue and net income attributed to this subsector, however, comes from large diagnostic laboratories (e.g., Quest Diagnostics, Laboratory Corporation of America) and contract research organizations (CROs) (e.g., Covance).

Given the inclusion of early-stage R&D firms (though still public companies) throughout many of these subsectors and their typically limited revenue potential, an additional analysis was developed based upon the revenue "size" of the firm.

Based upon this analysis, 85 percent of the bioscience industry's net income from public companies was generated by the largest 15 firms (those with $10 billion or more in fiscal year 2009 revenue). If considering all firms with $1 billion or more in revenue (79 firms), these firms account for 93 percent of all revenue earned and 109 percent of all net income earned (considering negative net income by many firms) by the bioscience industry.

Bioscience Financial Performance by Revenue Size Class, FY 2009

Revenue Size Class	Number of Public Firms in Dataset	FY 2009 Revenue		FY 2009 Net Income	
		$ Millions	% of Industry	$ Millions	% of Industry
$10 Billion +	15	$357,204	62%	$63,300	85%
$1–$9.99 Billion	64	$176,092	31%	$17,599	24%
$500–$999 Million	19	$12,062	2%	$808	1%
$250–$499 Million	42	$14,808	3%	$717	1%
$100–$249 Million	60	$9,147	2%	$(757)	-1%
$25–$99.9 Million	121	$6,427	1%	$(1,729)	-2%
$1–$24.9 Million	188	$1,587	0%	$(3,236)	-4%
>$0 to <$1 Million	57	$22	0%	$(1,048)	-1%
$0–No Revenue	83	$(0)	0%	$(1,111)	-1%
Industry Total	649	$577,349	100%	$74,544	100%

This analysis clearly shows that overall revenue size is the most predominant determiner of the financial performance of the bioscience industry in fiscal year 2009.

Industrial Biotech: A Rapidly Expanding Bioscience Field With Demonstrated Economic Value

Industrial biotechnology uses biological tools, such as microbes and enzymes, to produce value-added products. Modern scientific knowledge has opened the book of life to new chapters in enzyme and microbiological resource discovery and development, and industrial biotechnologists are expanding the application and engineering of cell lines, microbes, and enzymes into a broad variety of industrial processes. Via fermentation, biosynthesis, biochemical-catalysis, and other "life" processes, industrial biotechnology leverages the complexity and refinement of the natural world, building upon biological structures and processes to create efficient, sustainable, and environmentally friendly manufacturing technologies.

Fundamental business principles are driving the increased application of biotechnology to industrial processes—the need to add value, increase process efficiency, reduce production costs, and introduce new and better products to the marketplace. Industrial biotechnology is proving to be a highly flexible, cost-effective, and sustainable tool for achieving these business goals and represents a key tool for modern economic growth and sustainable industrial and global development.

The range of industries using industrial biotechnology is broad and expanding. For example, key applications of biotech are seen in the production of the following:

- *Food and beverage products*
- *Pharmaceuticals*
- *Vaccines*
- *Vitamins*
- *Bulk chemicals and specialty chemicals*
- *Biofuels*
- *Bio-based plastics and polymers*
- *Pulp and paper*
- *Textiles*
- *Cosmetics and personal care products*
- *Packaging materials*
- *Environmental remediation technologies*

In addition to providing specialized production tools and technologies across a range of industries, industrial biotechnology is making possible a move into a new and sustainable biobased economy, as opposed to a nonsustainable petroeconomy. The United States' large landmass, in concert with very high levels of productivity in agriculture and forestry, provides the resources for a new biobased economy using domestically grown natural biomass resources. Agricultural biotechnology is increasing the production of biomass, while industrial biotechnology provides the tools to efficiently convert that biomass into energy, liquid fuels, plastics, materials, chemicals, fibers, and other high-value products, thereby building a new and sustainable platform for modern economic development and progress. Of particular interest to economic developers is the fact that this agricultural and industrial bioeconomy provides a model for development that is geographically dispersed (rather than focused in just a few technologically intensive cities). Value-added conversion of biobased resources (especially low-bulk density cellulosic biomass) into value-added products tends to occur close to the location in which the biomass is produced. Thus, the conversion of biological resources into value-added manufactured products represents a present and growing opportunity for every state in the United States and perhaps, for the first time in a long-time, a platform for the economic revitalization of rural and small town America.

Industrial biotechnology is providing the means to transform manufacturing via the application of biobased resources, technologies, and processes. Through the application of science and advanced technologies industrial biotechnologists are using the processes of life to make life better. Industrial biotechnology is a flexible, modern tool producing new products and enhancing industrial efficiency. The net result is the creation of new, high-quality jobs and economic development.

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